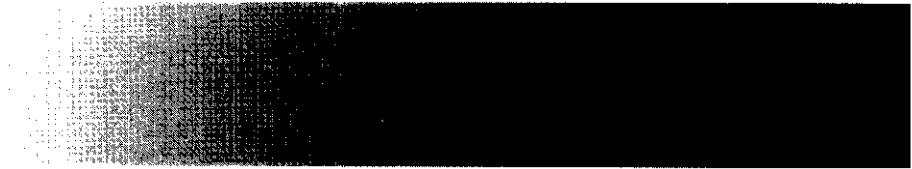


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**U.S. Department of Energy
Idaho Operations Office**

***Waste Area Group 5
Operable Unit 5-12
Comprehensive
Remedial Investigation/Feasibility Study***



**Waste Area Group 5
Operable Unit 5-12
Comprehensive
Remedial Investigation/Feasibility Study**

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Operable Unit 5-12
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ABSTRACT

The development and results of the Idaho National Engineering and Environmental Laboratory (INEEL) Waste Area Group (WAG) 5 comprehensive remedial investigation/feasibility study are presented in this report. The Auxiliary Reactor Area (ARA) and the Power Burst Facility (PBF), which are subdivided into 13 operable units and 55 individual potential sources of contamination, compose WAG 5.

The report includes both a human health risk assessment and an ecological risk assessment to evaluate potential impacts to flora and fauna. Descriptions of the regulatory background, site evaluations, nature and extent of contamination, groundwater evaluations, and risk assessment methodology are presented to support the risk characterization for both human and ecological receptors.

Based on the future residential scenario and ecological risks, seven sites were forwarded to the feasibility study for evaluation of remedial alternatives: three evaporation ponds (ARA-01, ARA-12, and PBF-16), a sanitary septic system (ARA-02) an underground storage tank for radionuclides (ARA-16), a large contaminated surface soil area (ARA-23), and contaminated soil area beneath the ARA-I hot cells (ARA-25). Contaminants of potential concern for human health include the radioisotopes cesium-137, radium-226, and silver-108m, the polychlorinated biphenyl Aroclor-1242, and arsenic. Contaminants of concern for ecological receptors are copper, mercury, lead, selenium, and thallium metals. External exposure to radiation was the only exposure pathway for current and future occupational scenarios with risks in excess of 1E-04.

The feasibility study identified candidate remedial actions to address the risks at the seven WAG 5 sites. In addition to evaluating soil remediation, the feasibility study also considered options to remediate the sludge in the ARA-02 seepage pit and the contents of the ARA-16 tank. Candidate technologies and process options were surveyed to develop combinations of actions for WAG 5 remedial alternatives. The remedial alternatives were evaluated against seven of the nine criteria developed by the U.S. Environmental Protection Agency, with the evaluation of the last two criteria, state and public acceptance, deferred until the proposed plan is available to the public.

In addition to the no action alternative, which was evaluated to provide a baseline for comparison, five combinations of options for soil, four combinations of options for the ARA-16 tank site waste, and one for the ARA-02 seepage pit sludge, were retained for the detailed analysis of alternatives. The five options for contaminated soil are (1) excavation, consolidation, and containment within WAG 5 with an engineered barrier; (2) removal and disposal within the INEEL; (3) removal and disposal off-Site; (4) removal, ex situ sorting, and disposal within the INEEL; and (5) removal, ex situ sorting, and disposal off-Site. The two alternatives retained for the contents of ARA-02 seepage pit are (1) removal, ex situ thermal treatment, and disposal; and (2) in situ stabilization and encapsulation. The four alternatives retained for the ARA-16 tank site are (1) in situ vitrification (ISV) at the tank site, (2) removal and ISV of the intact tank at Test Area North, and (3) removal of the contents of the tank for ISV at Test Area North, and (4) removal, ex situ thermal treatment, and disposal. Based on the retained alternatives, a set of preferred alternatives will be developed in the WAG 5 comprehensive proposed plan.

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ACRONYMS AND ABBREVIATIONS

ABS	absorbed through skin (dermal absorption factor)
AF	adjustment factor
ALARA	as low as reasonably achievable
AMWTF	Advanced Mixed Waste Treatment Facility
ANL-W	Argonne National Laboratory-West
ARA	Auxiliary Reactor Area
ARAR	applicable or relevant and appropriate requirements
ATSDR	Agency for Toxic Substance Disease Registry
BAF	bioaccumulation factor
BLM	Bureau of Land Management
BRA	baseline risk assessment
BTEX	benzene, toluene, ethylbenzene, and xylene
C2	Category 2
CDC	Conservation Data Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CF	concentration factor
CFA	Central Facilities Area
CFR	<i>Code of Federal Regulations</i>
CLP	Contract Laboratory Program
COC	contaminant of concern
COCA	Consent Order and Compliance Agreement
COPC	contaminant of potential concern
cpm	counts per minute
cps	counts per second

CRDL	contract-required detection limit
CRQL	contract required quantitation limit
CSM	conceptual site model
CV	contaminant in vegetation
D&D	decontamination and dismantlement
DEHP	di-2-ethylhexyl-phthalate
DEP	diethylphthalate
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations
DQO	data quality objective
EBSL	ecologically based screening level
ED	exposure duration
EDTA	ethylenediaminetetraacetic acid
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
ERIS	Environmental Restoration Information System
ESRP	Eastern Snake River Plain
FFA/CO	Federal Facilities Agreement and Consent Order
FS	feasibility study
FSP	field sampling plan
GCRE	Gas Cooled Reactor Experiment
GI	gastrointestinal
GIS	Geographic Information System
GPRS	global positioning radiometric scanner
GPS	global positioning system

GRA	general response action
ha	hectare
HEAST	Health Effects Assessment Summary Tables
HEPA	high-efficiency particulate air (filter)
HI	hazard index
HQ	hazard quotient
ICP	inductively coupled plasma
ICDF	INEEL CERCLA Disposal Facility
ICRP	International Committee on Radiological Protection
IDAPA	Idaho Administrative Procedures Act
IDEAMS	Integrated Data Environmental Management System
IDFG	Idaho Department of Fish and Game
IDHW	Idaho Department of Health and Welfare
INEEL	Idaho National Engineering and Environmental Laboratory
INEL	Idaho National Engineering Laboratory
INPS	Idaho Native Plant Society
INTEC	Idaho Nuclear Technology and Engineering Center (formerly the Idaho Chemical Processing Plant)
IR	ingestion rate
IRIS	EPA Integrated Risk Information System
ISV	in situ vitrification
K_d	soil-to-water partition coefficient
K_{oc}	organic carbon partition coefficient
K_{ow}	octanol-water partition coefficient
K_p^w	permeability coefficient of water through skin
keV	kiloelectron volt

LD	lethal dose
LDR	land disposal restriction
LITCO	Lockheed Idaho Technologies Company
LMITCO	Lockheed Martin Idaho Technologies Company
LOAEL	lowest observed adverse effect level
MCL	maximum contaminant level
MCP	management control procedure
MDL	method detection limit
MDL	minimum detection limit
MeV	megaelectron volt
ML	Mobile Low Power Reactor
MWSF	Mixed Waste Storage Facility
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no observed adverse effect level
NPL	National Priorities List
NRF	Naval Reactors Facility
NRTS	National Reactor Testing Station
NTS	Nevada Test Site
MORE	Organic-Moderated Reactor Experiment
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
Parsons	Parsons Environmental Technologies Group, Inc.

PBF	Power Burst Facility
PCB	polychlorinated biphenyl
pCi	picocurie
pp ^b	parts per billion
PRG	preliminary remediation goal
PUF	plant uptake factor
QAPjP	quality assurance project plan
QA/QC	quality assurance/quality control
QC	quality control
QCE	quantified critical exposure
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
redox	oxidation-reduction
RESL	Radiological and Environmental Sciences Laboratory
RfD	reference dose
RI	remedial investigation
RI/BRA	remedial investigation/baseline risk assessment
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RPD	relative percent difference
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area

SDGA	site data gap analysis
SF	slope factor
SL-1	Stationary Low-Power Reactor No. 1
SLERA	screening-level ecological risk assessment
SLQ	screening level quotient
SPERT	Special Power Excursion Reactor Test
SRPA	Snake River Plain Aquifer
SUF	site use factor
SVOC	semivolatile organic compound
TAN	Test Area North
TCLP	toxicity characteristic leaching procedure
T/E	threatened or endangered
TPH	total petroleum hydrocarbons
TRA	Test Reactor Area
TRV	toxicity reference value
TSCA	Toxic Substance Control Act
UCL	upper confidence level
USFS	U.S. Forest Service
USFWS	U. S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTL	upper tolerance limit
VOC	volatile organic compound
WAG	waste area group
WCS	Waste Control Specialists LLC
WEDF	Waste Engineering Development Facility

WERA waste area group ecological risk assessment
WERF Waste Experimental Reduction Facility
WWP Warm Waste Pond

